CLAIMS

1. An etched interconnect for fuel cell elements comprising solid oxide electrolyte, an anode, and a cathode, wherein said interconnect comprises:

a single conductive base sheet having first and second faces on opposite sides of said base sheet;

anode gas flow passages disposed on said first face of said base sheet;

cathode gas flow passages disposed on said second face of said base sheet;

wherein said anode gas flow passages and said cathode gas flow passages have a geometry selected to optimize fuel and oxidant gas flow according to system requirements.

2. The interconnect of claim 1, wherein said anode gas flow passage geometry comprises a large quantity of small diameter, closely spaced contact points.

3. The interconnect of claim 2, wherein said contact points are present on said anode face at a density of about 10 to about 25 contact points per square centimeter.

4. The interconnect of claim 2, wherein said contact points are generally round and have a diameter of about 0.5 to about 1 millimeter.

5. The interconnect of claim 1, wherein said cathode gas flow passages comprise deep flow passages to promote oxidant mixing and a large surface area for optimum heat transfer to the cathode gas stream.

6. The interconnect of claim 5, wherein said cathode gas flow passages have a depth of about 1.0 mm.

7. The interconnect of claim 5, wherein said cathode gas flow passages have a surface area of about 2 to about 4 times the projected area of said second face of said base sheet.

8. The interconnect of claim 1, further comprising:

a conductive coating disposed on one or more faces of said conductive base sheet, said conductive coating selected to enhance electrical conductivity between said interconnect and mating fuel cell surfaces.

9. The interconnect of claim 1, further comprising:

a yielding layer disposed on one or more faces of said conductive base sheet, said yielding layer selected to enhance conformity of said interconnect to mating fuel cell surfaces.

10. The interconnect of claim 1, further comprising:

through passages arranged along outer perimeters of said interconnects to form integral inlet and outlet manifolds when stacked.

11. A method for preparing an interconnect comprising:

preparing anode gas flow passages on a first face of a conductive base sheet having first and second opposite faces;

preparing cathode gas flow passages on said second face of said conductive base sheet; and

selecting anode gas flow passage geometry and cathode gas flow passage geometry so as to optimize fuel and oxidant gas flow according to system requirements.

12. The method of claim 11, wherein said anode gas flow passages comprise a large quantity of small diameter, closely spaced contact points.

13. The method of claim 12, wherein said contact points are present on said first face at a density of about 10 to about 25 contact points per square centimeter.

14. The method of claim 12, wherein said contact points are generally round and have a diameter of about 0.5 to about 1 millimeter.

15. The method of claim 11, wherein said cathode gas flow passage geometry comprises deep flow passages to promote oxidant mixing and a large surface area for optimum heat transfer to the cathode gas stream.

16. The method of claim 15, wherein said cathode gas flow passages have a depth of about 1.0 mm.

17. The method of claim 15, wherein said cathode gas flow passages have a surface area of about 2 to about 4 times the projected area of said second face of said base sheet.

18. The method of claim 11, further comprising:

disposing a conductive coating on one or more faces of said conductive base sheet, said conductive coating selected to enhance electrical conductivity between said interconnect and mating fuel cell surfaces.

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19. The method of claim 11, further comprising:

disposing a yielding layer on one or more faces of said conductive base sheet, said yielding layer selected to enhance conformity of said interconnect to surface irregularities in mating fuel cell surfaces.

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20. The method of claim 11, further comprising:

preparing through passages arranged along outer perimeters of said interconnects to form integral inlet and outlet manifolds when stacked.

21. The method of claim 11, wherein said preparing said anode and cathode gas flow passages comprises etching said conductive base sheet to form said anode and cathode gas flow passages thereon.

22. The method of claim 11, wherein said preparing said anode and cathode gas flow passages comprises photochemical etching, electrochemcal etching, cutting, laser cutting, or a combination thereof, said conductive base sheet to form said anode and cathode gas flow passages thereon.

23. A fuel cell stack assembly comprising a plurality of fuel cell elements comprising solid oxide electrolyte, an anode, and a cathode, stacked anode to cathode and interleaved with etched interconnects, said interconnects comprising:

a single conductive base sheet having opposing first and second faces;

said first face having anode gas flow passages disposed thereon; and

said second face having cathode gas flow passages disposed thereon;

wherein said anode gas flow passages and said cathode gas flow passages have a geometry selected to optimize fuel and oxidant gas flow according to system requirements.

24. The fuel cell assembly of claim 23, wherein said anode gas flow passages comprise a large quantity of small diameter, closely spaced contact points, and

said cathode gas flow passages comprise deep flow passages to promote oxidant mixing and a large surface area for optimum heat transfer to the cathode gas stream.

25. The fuel cell assembly of claim 23, further comprising:

gas supply manifolds comprising external stamped sheet metal manifolds secured to outer surfaces of said fuel cell stack assembly.

26. The fuel cell assembly of claim 23, further comprising:

integral gas supply manifolds comprising through passages arranged along outer perimeter portions of said interconnects so that said interconnect gas supply through passages align with matching through holes in said fuel cells.

27. The fuel cell assembly of claim 23, wherein said interconnects are fused to said fuel cells.

28. The fuel cell assembly of claim 23, further comprising:

a conductive coating disposed on one or more faces of said conductive base sheet, said conductive coating selected to enhance electrical conductivity between said interconnect and mating fuel cell surfaces.

29. The fuel cell assembly of claim 23, further comprising:

a yielding layer disposed on one or more faces of said conductive base sheet, said yielding layer selected to enhance conformity of said interconnect to surface irregularities in mating fuel cell surfaces.